

DOCUMENT RESUME

ED 054 330

VT 012 185

TITLE Program for Educational Mobility for Health Manpower (The Basic Sciences), June 12-August 25, 1970. Preliminary Report.

INSTITUTION Coordinating Council for Education in the Health Sciences for San Diego and Imperial Counties, Calif.

PUB DATE 70

NOTE 69p.

EDRS PRICE EDRS Price MF-\$0.65 HC-\$3.29

DESCRIPTORS *Core Curriculum, *Curriculum Development, *Educational Mobility, Entry Workers, *Health Occupations Education, Occupational Information, Paramedical Occupations, Science Courses, Task Analysis, Task Performance, Workshops

ABSTRACT

Community college administrators and faculty in the areas of anatomy, physiology, chemistry, physics, and microbiology attended an 11-day workshop to redefine, modify, and develop science concepts for a core curriculum in the allied health field. To achieve workshop objectives, the committee heard presentations by consultants, visited clinical areas utilized in teaching, and collected task analyses of the entry-level tasks for medical assistant, dental assistant, radiologic technologist, inhalation therapist, licensed vocational nurse, registered nurse, and physical therapist assistant. On the basis of the task analysis, instructional units in anatomy and physiology, microbiology, physics and math, and chemistry were proposed for each occupational area. Before making final recommendations, the committee members decided to report the proposed curriculum to their departments and colleges and then plan for a later workshop. Consultants and organizations contacted, job descriptions, and a sample dental assisting program are appended. A second report is available as VT 012 909 in this issue. (SB)

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ABSTRACT

PRELIMINARY REPORT--PROGRAM FOR EDUCATIONAL MOBILITY
FOR HEALTH MANPOWER (THE BASIC SCIENCES)

A science faculty committee representing four community colleges in San Diego and Imperial counties met with allied health educators, advisory members and graduates of community college allied health programs to examine science curricula required in the allied health professions in order to design core curricula leading to greater career mobility. A systems approach utilizing concept modules was suggested for the following allied health professions: Medical Assistant, Dental Assistant, Radiologic Technologist, Inhalation Therapist, Biomedical Technologist (Cardiopulmonary Specialist), Physical Therapist Assistant, Licensed Vocational Nurse, Registered Nurse.

In order to provide maximum local community college faculty and administrative review of the recommendations since the modules were developed in 11 weeks during the summer, a curriculum workshop in Basic Sciences for Allied Health Professions in the Community Colleges was proposed. At this workshop, the individual community college allied health educators and the science faculties could meet and work together, as well as share across colleges to refine, modify and develop the science concepts recommended in the preliminary report.

Doris A. Meek, Director

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PRELIMINARY REPORT--PROGRAM FOR EDUCATIONAL MOBILITY
FOR HEALTH MANPOWER (THE BASIC SCIENCES)

FUNDED BY REGIONAL MEDICAL PROGRAM VII

COORDINATING COUNCIL FOR EDUCATION IN THE HEALTH SCIENCES
FOR SAN DIEGO AND IMPERIAL COUNTIES

June 12 - August 25, 1970

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TABLE OF CONTENTS

- I. INTRODUCTION
 - The Project
 - Rationale
 - Objectives
 - Calendar
- II. CURRICULUM
 - Core Curriculum
 - Career Lattice
 - Learning
 - Faculty Community College Involvement
- III. METHODOLOGY PROCESS
 - Committee Recruitment
 - First Steps
 - Consultants
 - Visitations
 - Models
 - Task Analysis
 - The Science-Health Interface
- IV. RESULTS
 - Anatomy and Physiology
 - Paramedical Instructional Units
 - Proposed Paramedical Units of Instruction
 - Medical Assistant
 - Dental Assistant
 - Radiologic Technologist
 - Inhalation Therapy
 - Biomedical Technician
 - Physical Therapy Assistant
 - Microbiology
 - Introduction
 - Core Curriculum
 - Special Training Modules
 - Inhalation Therapist
 - Biomedical Technician
 - Calibration, Standards and Repair Technician
 - Cardio-pulmonary Specialist
 - Physiological Monitoring Specialist
 - Radiologic Technologist
 - Dental Assistant
 - Physical Therapy Assistant
 - Medical Assistant
 - Nursing

Physics

- Physics and Math
- Physics for Dental Assistants
- Physics for Radiologic Technologist, Cardiopulmonary Technologist
- Physics for Physical Therapist Assistant
- Physics for Nursing and Licensed Vocational Nurse

Chemistry

V. PROBLEMS AND ISSUES

- Educational Requirements
- Hours vs. Behavioral Objectives
- Concept Modules and Levels
- Continuing Education
- Professional Certification, Registry and Licensure
- Transfer Requirements

VI. RECOMMENDATIONS

VII. NOTES TO THE REPORT

VIII. ADDITIONAL REFERENCES

IX. APPENDICES

- A. Consultants Interviewed
- B. Organizations and Individuals Contacted
- C. Job Description
- D. Mesa College Dental Auxiliary Programs
- E. "Foundation" Model for Integrated Science Course

I. INTRODUCTION

The Project

The Coordinating Council for Education in the Health Sciences for San Diego and Imperial Counties has identified as one of its major concerns the provision of increased utilization of health manpower in order to improve the quality and extent of health services.

The Task Force core curriculum recommended at the June 10th, 1970 Council Meeting that a community college areawide representative faculty committee from anatomy, physiology, chemistry, physics and microbiology be charged with the responsibility to examine science curricula required in the allied health professions. The goal of providing greater career mobility in the allied health professions through the development of core curricula was suggested. The Coordinating Council endorsed the recommendation, and Regional Medical Program provided funding for an eleven week study.

Rationale

Dr. Harold Margulies, Acting Director of the Division of Regional Medical Programs at the Second National Regional Medical Program Conference, spoke of the philosophy and direction of Regional Medical Programs for the future, in that the current health system has done so poorly that we need a total new system; there is no shortage of manpower, but a need to upgrade present personnel through educational mobility and to effectuate better utilization. Dr. Margulies indicated, also, that both Regional Medical Program and Comprehensive Health Planning have a thrust for change and that Regional Medical Program should not be afraid of innovative ideas in pushing for change.

John H. Knowles, M.D., writing in the August 22, 1970 issue of Saturday Review, devoted to "Health Care Rx for Change," stated that the resolution of the mammoth problems besetting the health field demands a holistic multidisciplinary approach. For example, solving the issues of cost, quality, equality of access demand, fundamental changes in public-private financing mechanisms, public education, manpower supply and use, regional planning and medical education.¹

Dr. Clifford Grobstein, Chairman of the Coordinating Council for Education in Health Sciences for San Diego and Imperial Counties at the June 10, 1970, meeting indicated in response to the Council's approval of the proposed project that the Committee not be limited to the consideration of one occupation (LVN to RN), but extend parameters in the allied health field from the aide to the professional. In addition, he cautioned that the Committee's thinking not be tied into courses, units and hours, but to fundamental concepts--what has to be communicated at various levels.

Dean Allen Paul, Chairman of the Core Curriculum Task Force, described the Committee's responsibility by saying, "You come up with the ideas, let us worry about the packaging!"

The recent American Association of Junior Colleges' publication, Vision: Health and Medical Technology Education Programs, included articles from the American Medical Association Journal on "Core Curriculum in Allied Health Education" and "Career Mobility in Allied Health Education,"² indicating the concerns of the American Medical Association and the American Association of Community Colleges on this subject.

Howard B. Kirtland, M.D., Chairman of the San Diego County Health Manpower Committee, at the March, 1970, Grossmont College Conference on

¹All footnotes refer to Part VII, Notes to the Report.

Biomedical Technology and Manpower, stated that many of these allied health personnel have basic similarities in their background needs, and a core curriculum would give increased understanding of each others' function-- thus the aide would aspire, with further training, to become an LVN; the LVN, with further training, could become an R.N. without repetition of work which was previously required. (Recent legislation has mandated the granting of academic credit for the Licensed Vocational Nurse (LVN) Toward the Registered Nurse (R.N.) degree. The core curriculum task force has proposed a pilot program to be initiated by 1971 to offer the LVN upward mobility toward the R.N. within one year.)

Objectives

While the University of California, Los Angeles, federally funded "Allied Health Professions Projects"³ was in process to resolve some of these same areas of concern, it was felt that there was an urgency for the local community colleges to accept the challenge at this time to reexamine the basic science core components of the various allied health programs. As a result of the rapid development of allied health programs, proliferation of courses and requirements in the sciences often resulted in overburdened faculty and laboratory facilities. It was time to take a broader view.

The committee proposal provided an opportunity for those teaching in the science areas (and not only for the nursing faculty, but others in the allied health fields) to provide input on performance tasks and to join in exploring the possibilities for an integrated science core.

Three of the objectives proposed for study by the area-wide committee were:

1. To provide the students in the health related fields with a thorough, up-to-date background in the sciences, specifically in the areas of anatomy, physiology, microbiology, physics and chemistry as applicable to all of these areas.
2. To provide all students enrolled with a level of general education in the field of biology and allied sciences comparable to that offered in science courses required as general education in other curricula.
3. To provide, within the framework of the preceding statements, a course sequence that lays a foundation for, supplements and complements, the content of additional courses in the health related fields.

Specific aims of the program were:

1. To identify a "science" team of successful San Diego and Imperial County community college instructors from anatomy, physiology, microbiology, chemistry and physics.
2. To identify the area allied health professions educators.
3. To work both individually and collectively (basic science team and local allied health profession representatives) to identify basic science required for job competence.
4. To outline the process for future implementation to insure career mobility.

The specific aims of the Committee were to be directed to curriculum--the objectives (the ends, that is) - an educational system (and in this instance, the allied health curriculum) hopes its learners will achieve. The instructional questions revolving around the means used to achieve these ends were not considered. It was not that they were not important, as they were,

and certain tentative suggestions did develop, but solely due to the lack of time to explore the methodology in depth the preliminary step was limited.

Calendar

An 11-week summer session calendar was proposed in order to take advantage of faculty available during the summer vacation period.

Phase One: June 10 to June 30. Contact presidents and deans of local community colleges in order to obtain recommendations for team members. To conduct a self-learning seminar, become acquainted, share ideas, research pertinent literature and/or resources.

Phase Two: July 1 to 10. Explore parameters of the problem, hospital visitation, and decide on methodology for the study.

Phase Three: July 13 to August 14. Implement strategy and methodology.

Phase Four: August 15 to 25. Written report of conclusions and recommendations for next steps.

II. CURRICULUM

Core Curriculum

The definition of a core curriculum presumes that within the allied health occupations there is a commonality of information and skills which is relevant to all students. The logic, economy and related values of the core course and core curriculum have continued more as pious declarations of intent than a conviction and fact of operational curricular life. Therefore, in order to determine what knowledges and skills are essential in the sciences for each allied health occupation, it was necessary to break down the traditional academic boundaries of hours, courses, units and settle on the basic concepts before rebuilding could take place. Human anatomy can range from one hour a week to a lifetime of study, so

how does one determine what concepts are required in each occupation, correlate these into a "package" and then how does one approach these concepts in an appropriate sequence to enable students to gain that knowledge required for his occupational area? What is essential?

To meet varying individual differences determined by the instructor and the student, options must also be provided to go beyond the basics as tempered by teaching and the amount of time that prevails. The emphasis must not be on the boundaries as they now are, but on the nature of the material, not on courses, but on learning.

Career Lattice

What has to be communicated at various levels leads to not just a ladder approach, but a lattice providing students options for decision making at various points along the continuum, horizontally as well as vertically. The students' own goals provide the motivation toward the full actualization of his own potential, providing opportunities are open ended to challenge him.

Learning

As Bruner remarks, the curriculum must consider the learner and the learning process, as well as the nature of knowledge.⁴ To understand the fundamental structures of the discipline is the best approach to transfer of training since transfer depends not only on what a person learns but also on how he learns it. The changing concepts of learning indicate in addition to the mastery of broad concepts and principles the need for experiences which encourage adaptation, generalization and application. The Committee, while not organizing the instructional experiences, had to focus on the relevance of each curriculum component in view of the overall

goal. The Committee was faced with finding a path between the process of education and the process of training area, as Eisner states:

The process of education enables individuals to behave intelligently through the exercise of judgment in situations that demand reflection, appraisal and choice among alternative courses of action. The process of training develops specific types of behavioral responses to specific stimuli or situations.⁵

Faculty Community College Involvement Process

It is presumptuous to present broad aims and objectives, concepts, and principles for curriculum change unless active involvement of the concerned faculty was sought--any recommendation on curriculum change without such is doomed. Dressel adds:

No solution will emerge which is more than a patchwork of compromises, a reluctant agreement by diverse and competing interests to experiment with new ideas as long as they involve minimal interference with vested interests.

The Committee, while sanctioned by the Coordinating Council, which included representatives from their respective community colleges and professional societies, raised most often the question: Was this to be an exercise in futility or would the concerned faculty, curriculum committees and administrative heads see the value of the recommendations developed and seek local college implementation of those they felt worthy of total college support?

III. METHODOLOGY

Committee Recruitment

The integrated science faculty composing the Committee were recruited on the basis of administrative and faculty-department recommendations from four community colleges. Those selected had indicated a prior interest in core curriculum or departmental subject matter concerns and were available to meet during the summer.

First Steps

Upon meeting together, it was soon apparent that with the limitations of time and resources only the first step of a rather involved process of curriculum change could be undertaken in eleven weeks. After researching the field and contacting resources in community colleges, universities, health care fields, professional groups, voluntary and tax-supported organizations (see Appendix), the pittance of hard data as of July 1970 was mystifying. Articles had been written on "core curricula," Ph.D. theses granted on the topic; yet the two most promising resources, UCLA and Long Beach City College, were not far enough along to be of immediate assistance.

Consultants

Representatives from the University of California at Los Angeles Allied Health Professions project and the Long Beach City College Biology Core Program were contacted. Miss Virginia Thomas, biology instructor at Long Beach City College in the health technologies area, made a presentation to the Committee and interested Allied Health Educators.⁷ Dr. Richard Kingston, Senior Associate Director of University of California at Los Angeles Allied Health Professions Projects made a later presentation to the same group on the dental auxiliary professions.⁸

Visitations

The science team visited the clinical areas utilized in teaching, and the Allied Health Educators explained the tasks required of the technicians. The Science Committee observed health care and treatments in process.

Models

Four diverse models were explored in an effort to find a focus for the work of the Science Committee. One method, exemplified by Fullerton's research on "The Identification of Common Courses in Paramedical Education,"⁹ was utilized in the Mesa College study of the proposed dental auxiliary occupations curricula, "Course by Title With Degree of Core Application" (see appendix).

Another approach was Wallenstein's Ph.D. study of "Knowledges Commonly Useful in Twelve Allied Health Occupations."¹⁰ However, Spokane College, where the study was completed, has not as yet utilized his research.

The third approach was Stern's "Conceptual Models,"¹¹ in which a curriculum change matrix was proposed. One member of the Committee further developed this idea (see appendix).

The fourth approach was the examination of tasks required at entry-level placements. The Committee felt it could not move ahead until it clearly could identify what the student was going to do at what level, under what circumstances, upon completion. In other words, performance must determine preparation.

Task Analysis

The Health Manpower Council of California's recent publication on task analysis lent support to the final path that was chosen. The Committee decided that the performance required for entry-level jobs was the starting point from which they could progress back to the curriculum.

Each Allied Health Educator was requested to submit to the Science team the most recent analysis of the entry-level tasks identifying the action, frequency and knowledge required to perform it as well as why it was being performed.

"A Task analysis is a dissection of all the tasks for a position into their component parts, showing for each task:

1. The action--what is going on?
2. The mental and physical skill necessary--how is it being done?
3. The purpose of the task--why is it necessary?
4. The specific knowledge required to perform each task.
5. Accurate estimates of the time spent on each task.

A task analysis is not a job description, a time and motion study, a list of tasks, or a description of intangible qualities required of a worker, such as 'initiative,' 'responsibility,' etc."¹²

The director and Regional Medical Program representative made a special trip to talk with Dr. Kay Goldsmith, Deputy Director, University of California at Los Angeles Allied Health Professions Project; and Lucille Wood, R.N., Associate Director; regarding the use of the Task Analysis Approach and the possibilities of sharing research already completed. Since the UCLA project had not verified its data and had not studied all of the same occupations that are taught in the San Diego area, it was possible to use but a limited amount of their data at this time. What was available was helpful, particularly the Dental Auxiliary Occupations Task Analysis, which served as the lead-off to a series of work sessions with Science Committee and Allied Health Educators.¹³

In cases where a discrete task analysis was not obtainable, the science team worked from documents submitted by the Allied Health educator or available from the national professional society and/or accrediting bodies. The Committee soon discovered that a carefully

developed task analysis provided them with the questions to ask the allied health educator, which enabled the Committee to break out the relevant science concepts and, at times, consider the sequencing of those concepts.

An example of a simplistic view of this approach is suggested by Tomlinson¹⁴ (see figure 1) in which he conveys the medical laboratory field, i.e., as based on disciplines from which subject matter is drawn to provide professional or occupational competencies. By knowing what performance is required at each level, including actions and judgments, then we would know how to raise each person from one level to another by adding certain additional learning experiences. Instead of professional societies stating, "We need 2400 clock hours," or "We need a basic course in anatomy and physiology," the performance level expected could be demonstrated, leading back to the components required in science.

Ralph Kuhli, Director, Allied Medical Professions, in the September, 1969, Allied Medical Education Newsletter, stated that:

The hospital is a sieve for too many allied health workers! We need a list of tasks for an occupation; we need to teach students the necessary proficiency to perform these tasks, and we must complete this education as efficiently and effectively as possible; and we need to pay allied health employees what they are earning, and give them chances to qualify for increases in responsibility and authority." ¹⁵

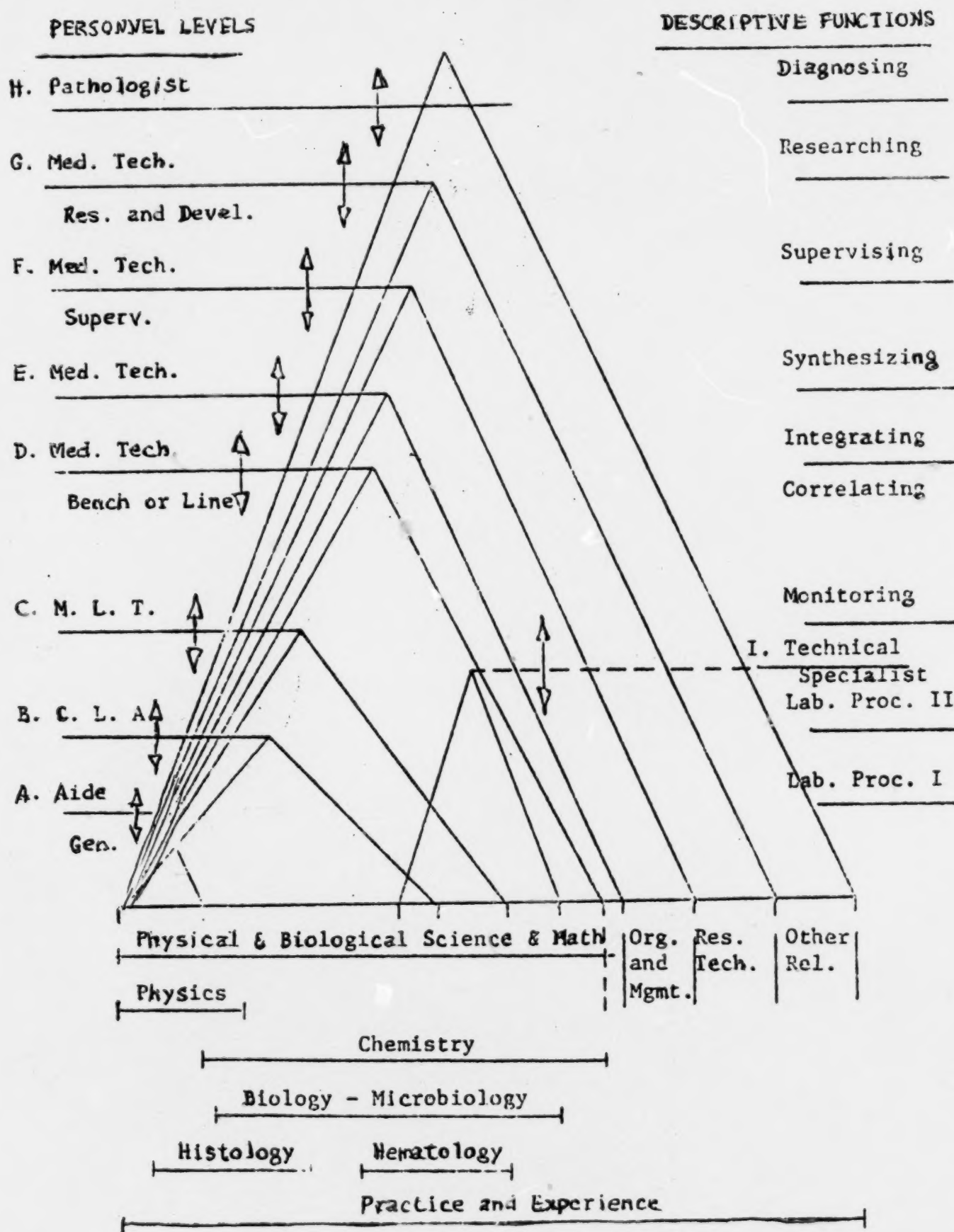
The Science-Health Interface

Meetings with the Committee and the allied health educators, a recent graduate of the program, and, if possible to obtain, an employer or member of their advisory board were scheduled for the seven allied health areas. All were invited so that the Science Committee would be able to question the product as well as the producers and users. Concepts were discussed back and forth always leading to "why is it necessary," and, if so, "in what depth."

Figure 1.

EXAMPLE ONLY

RELATIVE LEVELS OF PERFORMANCE AND BASE OF PREPARATION FOR
MEDICAL LABORATORY PERSONNEL



Cassette recordings were made of each meeting and minutes were written. A record was maintained of information which would be available for future use also.

The full cooperation, in fact eagerness to provide any information requested, by all the allied health representatives was greatly appreciated. Needless to say, nothing could be accomplished without their expertise and response.

The dialogues at times waxed hot and heavy, but the thrust of the Science Committee was focused on how they could be of greater help to the allied health educators in providing the didactic backup in the basic sciences that, indeed, would provide relevancy to the students' learning. At the same time, the Committee was hearing a number of themes running through all of the meetings which allied health educators were stating which were "essentials" for their students. A few of these were: Information on the health services industry, asepsis, mechanical aids for ambulation of patients, safety procedures.

The methods of Committee interaction, questioning, consulting, review and analysis culminated in a topical outline and/or statement from each member indicating the concepts he felt were "essential." (See Results.)

Time permitted but a brief review of these "essences" by the allied health educators. As stated previously, the results to date are "Preliminary," since but a beginning bench mark has been accomplished in a very short period of time.

IV. RESULTS

Anatomy and Physiology

Edward Roach, San Diego City College

Mike Clark, Southwestern College

Evelyn Kellogg, San Diego Mesa College*

*Did not participate full-time due to illness.

Paramedical Instructional Units

This draft contains a description of a number of instructional units together with recommendations about who should take them. It is proposed that these units, together with some additional instructional modules in physics and possibly chemistry will constitute the entire science portion of the training for entrance level placement in the various paramedical occupations. The instructional units are somewhat smaller in scope than conventional college courses and would vary considerably in the hours of study needed to complete them. This format offers the following advantages over traditional curriculums:

1. Students would take just those units and modules required for entry into their occupation and then take additional units or modules which might be helpful after employment. This flexibility might be particularly advantageous to specialists such as medical assistants and medical secretaries, the nature of whose work varies from office to office.

2. By taking combinations of these units, the student could complete all of the material that is traditionally included in anatomy and physiology courses and should be granted full credit for this work if he chose to transfer to a four-year institution.

3. Specialists, such as L.V.N.'s , could originally take post-entry level units to improve their skill with the assurance that they would be able to apply credit earned for all such units toward an A.A. nursing degree.

4. Combined demand for these units by students in different paramedical programs should insure that they would be regularly offered as day and/or evening classes.

5. The adoption of such a latticework of units and modules would provide a very flexible framework from which training programs in the different paramedical specialties could be constructed and later retailored, if the University of California, Los Angeles, functional analysis indicates the need.

6. County-wide adoption of such a format would allow for unified testing and improvement of the various units and modules and allow for cooperative development of instructional material by departments of the various colleges.

Proposed Paramedical Units of Instruction*

1. Survey of Health Occupations. Behavioral Objectives:

Learning how the health services delivery system works in hospitals, homes and schools; the organization of hospitals and the tasks and responsibilities of each of the specialists. Learning the avenues of lateral and vertical mobility open to workers in health care.

2. Medical Terminology and Reference Materials. Behavioral Objectives:

Learning how to use a medical dictionary and how to find and use the standard reference texts and periodical literature. Learning the most common prefixes and suffixes and words used in the health occupations.

*See Figure 2.

3. Introduction to Biochemistry. Behavioral Objectives:

Learning about the structure of matter, atoms, molecules, chemical bonding, chemical reactions, equations, factors influencing chemical reactions, acids, bases, neutralization, the pH scale, buffer systems, inorganic and organic substance of living matter, carbohydrates, lipids, proteins and their amino acid components, enzymes and nucleic acids.

4. Introduction to Medical Microbiology. Behavioral Objectives:

Learning the significance of microorganisms to human health. Learning to understand and apply aseptic, sterilizing and disinfecting techniques and to control the factors which influence microbial growth and spread.

5. Introductory Anatomy and Physiology. Behavioral Objectives:

Learning the organization of the body into cells, tissues, organs and systems. Systemic anatomy will be studied and functions will be learned at a level which can be mastered by students having little knowledge of chemistry.

6. Nutrition. Behavioral Objectives:

Learning the body's requirements of food nutrients and learning to formulate and evaluate diets in relation to the satisfaction of these requirements. Learning to use to advantage these psychic factors which promote appetite and digestion.

7. Oral Anatomy and Physiology. Behavioral Objectives:

Learning the regional anatomy of the face, jaws and mouth, as well as the function of these structures.

8. Regional Anatomy of the Nose, Mouth, Neck, Thorax and Major Blood Vessels.

Behavioral Objectives:

Learning the regional anatomy of the above-named regions. In any "hands on" situation, student should be able to find any significant structure and know its relationship to adjoining structures.

9. Blood, Circulatory and Respiratory Physiology. Behavioral Objectives:

Learning the physiology of the circulatory and respiratory system.

Topics to be studied (see Guyton, Function of the Human Body): Chapter 8, Blood Cells; Chapter 9, The Reticuloendothelial System, Immunity and Allergy; Chapter 10, Blood Coagulation, Transfusion, Chapter 11, Pumping Action of the Heart, Its Regulation; Chapter 12, Blood Flow Through Systemic Circulation and its Regulation; Chapter 13, Special Areas of the Circulatory System: Pulmonary, Coronary, Cerebral, Liver, Spleen, Muscle, Skin, Blood Flow; Chapter 14, Systemic Arterial Pressure and Hypertension; Chapter 15, Cardiac Output, Venous Pressure, Cardiac Failure, Shock; Chapter 16, Body Fluids, Capillary Membrane Dynamics, Lymphatic System; Chapter 19, Mechanics of Respiration and Transport of Oxygen and Carbon Dioxide; Chapter 20, Regulation of Respiration and the Physiology of Respiratory Abnormalities.

10. Regional Anatomy of the Abdomen and Pelvis. Behavioral Objectives.

Learning the regional anatomy of the above-named regions. In any "hands on" situation, student should be able to find any significant structure and know its relationship to adjoining structures.

11. Physiology of Urinary, Gastrointestinal, Metabolic and Reproductive Systems. Behavioral Objectives:

Learning the physiology of the above systems and the reasons behind the common maintenance and emergency procedures. Topics to be studied (see Guyton, Function of the Human Body): Chapter 17, Formation of Urine by the

Kidney and Micturition; Chapter 18, Regulation of Body Fluid Constituents and Volumes; Chapter 30, Gastrointestinal Movements and Secretion and Their Regulation; Chapter 31, Digestion and Assimilation of Carbohydrates, Fats, and Proteins; Chapter 32, Release of Energy From Foods; Chapter 33, Body Heat and Temperature Regulation; Chapter 37, Sexual Functions of the Male and Female Sex Hormones; Chapter 38, Reproduction and Fetal Physiology.

12. Anatomy and Function of Skeletal System. Behavioral Objectives:

Learning the general structure of bone, divisions of the skeleton and major bones of the body.

13. Anatomy and Function of the Muscular System. Behavioral Objectives:

Learning the detailed regional anatomy of skeletal muscles along with their innervation, blood supply and action in posture and movements.

14. Anatomy and Physiology of the Nervous System.

See Guyton, Function of the Human Body. Topics to be studied: Chapter 22, Design of the Nervous System and Basic Neuronal Circuits; Chapter 23, Somesthetic Sensations and Interpretation of Sensations by the Brain; Chapter 24, The Eye; Chapter 25, Hearing, Taste, Smell; Chapter 26, Motor Functions of the Spinal Cord and Lower Brain Stem; Chapter 27, Function of the Cerebral Cortex, Basal Ganglia, and Cerebellum for Control of Muscle Movements; Chapter 28, The Autonomic Nervous System and Hypothalamus; Chapter 29, Intellectual Processes; Sleep and Wakefulness; Behavioral Patterns, and Psychosomatic Effects.

Figure 2.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Units of Instruction		Dental Asst.	Dental Lab. Tech.	Inhal. Therapist	Med. Asst.	Med. Records	L.V.N.	Occupational Ther.	Phys. Therap. Asst.	Radiologic Tech.	Med. Secretary	Med. Lab. Asst.	Bio. Med. Repair Technician	Bio. Med. Cardio Resp. Spec.	Bio. Med. Physio. Monitoring	A. A. Dental Hygienist	A.A. Nursing
1	Survey of Health Occupations	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
2	Medical Terminology & Reference Material	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R
3	Introduction to Biochemistry			R	D		D		D			R	R	R	R	R	R
4	Medical Microbiology	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R
5	Introduction to Anatomy & Physiology	R		R	R	R	R		R	R	R	R	R	R	R	R	R
6	Nutrition				D		D									R	R
7	Oral Anatomy and Physiology	R	R	R												R	
8	Regional Anatomy of Nose, Mouth, Neck, Thorax	D		R			D		D	R			D	R	R	D	R
9	Blood, Circulatory & Respiratory Physiology (Concurrent with 8)			R			D						D	R	R		R
10	Regional Anatomy of Abdomen & Pelvis						D		D	R							R
11	Physiology of Urinary, Gastrointestinal, Metabolic, Reproduction Sys. (Concurrent with 11)						D										R
12	Anatomy of Skeletal System						D		R	R							D
13	Anatomy and Function Muscular System (Following 12)								R	D							D
14	Anatomy & Physiology Nervous System						D		R								
R = Required for entry into occupation.																	
D = Desirable for advancement within occupation.																	

Anatomy and Physiology

Medical Assisting

Systemic and Functional Anatomy. Introductory systemic anatomy presenting an overview of the organization of the body. Tissue types, organs and body systems would be studied, including study of the function of each structure at a level which could be comprehended by students having little knowledge of chemistry. Derivations of anatomical and physiological terminology will be included.

Skeletal: General structure of bone, divisions of the skeleton, major bones of the body.

Muscular: Classification of muscle tissue, major muscles of the body, classification of movements of appendages.

Nervous: Major divisions of the nervous system, the nerve impulse and synapse, the reflex arc.

Digestive: General digestive functions of the mouth, pharynx, esophagus, stomach, and intestines; digestive functions of the liver, pancreas, and gall bladder; causes of nausea and vomiting.

Circulatory: Structure and function of arteries and veins, gross anatomy of the heart, circulation of blood through the heart, blood pressure and the pulse, location of surface veins for blood collection, blood cells, blood clotting.

Lymphatic: Gross anatomy and general function of the lymphatic system.

Respiratory: Gross anatomy of the respiratory system, mechanics of breathing, types of breathing.

Endocrine: The secretions of endocrines and their functions.

Urinary: Gross anatomy of the urinary system.

Reproductive: Gross anatomy of the male and female reproductive systems.

A course in physiology would not appear to be necessary to perform medical assisting.

Dental Assisting

Topics in anatomy and physiology for the dental assistant include:

General introduction to the anatomy and physiology of the human (systems approach; 1-2 hours).

Development of teeth.

Anatomy and histology of teeth and their supporting structures.

General digestive functions of the mouth, pharynx, esophagus, stomach and intestines.

Detailed surface anatomy of the oral cavity and associated glands.

Composition of saliva and its regulation.

The process of swallowing.

Causes of nausea and vomiting.

Muscles and bones of the oral cavity.

Gross anatomy of the respiratory system.

Mechanics of breathing.

Types of breathing.

Circulation of blood in the oral region.

Cutaneous circulation; significance of skin color.

Blood clotting.

Blood pressure and the pulse.

The nerve impulse and synapse.

Role of epinephrine and acetylcholine in nerve transmission.

Distribution of the cranial nerves and ganglia.

Nerve receptors and effectors.

Special nerve receptors.

Radiologic Technology

Topics in anatomy and physiology for the radiologic technologists include:

Core: Systemic and functional anatomy. Systemic anatomy and physiology

to give the student an overview of the organization of the body.

Body plan, tissue types, organs and body systems would be studied.

This portion of the course would also include a brief study of

the function of each structure at a level which could be understood

by students having little knowledge of chemistry.

Derivation of anatomical and physiological terminology.

Specific for the Radiologic Technologist:

A section emphasizing the location of all the body organs using
surface landmarks.

Names and locations of all major bones in the body.

Only the most obvious muscles of the body. (We will include those
the technicians say they need to know.)

Names, location and flow of blood through all of the major blood
vessels in the body.

General distribution and flow of fluid through the lymph vessels.

Names and location of all organs of the reproductive tract.

Names, functions and locations of all structures of the ear.

General anatomy and movement of the eye.

Effects of X-ray on biological systems.

Inhalation Therapy

Topics in anatomy and physiology for the inhalation therapist include:

A general consideration of the physiology and anatomy of the human body (using systems approach) with emphasis on gross anatomy and general function of each organ in the body.

Derivation of terminology.

A special detailed consideration of the anatomy and physiology of the cardio-respiratory systems. This section should include the following topics:

- Organs of the respiratory system.
- Mechanics of respiration: mechanism of respiration, amount of air exchanged in respiration.
- Transport of O_2 and CO_2 .
- Regulation of respiration.
- Acid base regulation.
- Physiology of respiratory abnormalities.
- Structure of blood vessels.
- The major blood vessels.
- Composition of blood.
- Immunity.
- Blood transfusions and transplant of organs.
- The heart and its functions.
- Circulation of blood.
- The movement of molecules into and out of capillaries.
- Function of the lymphatic system.

Biomedical Technician (Cardio-pulmonary Specialist)

Topics in anatomy and physiology for the biomedical technician include:

A general consideration of the physiology and anatomy (using the systems approach) of the human body with emphasis on gross anatomy and general function of each organ in the body.

Derivations of terminology.

A special consideration of the anatomy and physiology of the cardiopulmonary, nervous and digestive systems. This section should include the following topics:

Organization and contraction of smooth muscle.

Organization and contraction of cardiac muscle.

Changes in electrical potential during the heart beat.

Electrical potentials of cell membranes.

Basic structure and function of the neuron.

Integration of nerve impulses

Organization and function of specific parts of the central nervous system:

Somesthetic sensations.

Functions of the spinal cord and lower brain stem.

Interaction of cerebral cortex, basal ganglia and cerebellum.

Autonomic nervous system and hypothalamus.

Gross anatomy of the nervous system.

Mechanics of respiration.

Transport of O_2 and CO_2 .

Regulation of respiration.

Acid base regulation.

Physiology of respiratory abnormalities.

Structure of blood vessels.

The major blood vessels.

Composition of blood.

Blood clotting mechanisms.

Immunity.

Blood transfusions and transplant of organs.

The heart and its functions.

Circulation of blood.

The movement of molecules into and out of capillaries.

Function of the lymphatic system.

Physical Therapy Assistant

Topics in anatomy and physiology for the physical therapist assistant include:

A general consideration of the physiology and anatomy (using systems approach) of the human body with emphasis on gross anatomy and general function of each organ in the body.

Derivation of terminology.

A special consideration of the anatomy and physiology of the muscular, nervous and circulatory systems and metabolism in relation to these systems.

This section should include the following topics:

Major bones of the body.

Organization of skeletal muscle.

Chemical reactions responsible for muscle contraction.

Characteristics of a muscular contraction.

The muscle twitch. Tetanus.

Summation. Organization of motor units.

Organization and contraction of cardiac muscle.

Organization and contraction of smooth muscle.

Surface anatomy, origin and insertion of major muscles.

Electrical potentials of cell membranes.

Basic structure and function of the neuron.

Integration of nerve impulses.

Organization and function of specific parts of the central nervous system:

Somesthetic sensations.

Functions of the spinal cord and lower brain stem.

Interaction of cerebral cortex, basal ganglia and cerebellum.

Autonomic nervous system and hypothalamus.

General anatomy of the nervous system:

The brain, the cranial nerves, the spinal cord and the spinal nerves.

Structure of blood vessels.

The major blood vessels.

The heart and its functions.

Circulation of blood.

Function of the lymphatic system.

Body metabolism.

Regulation of body temperature.

Microbiology

Anne Belovich, San Diego City College
Joan MacFarlane, Grossmont College

Introduction

The microbiology section of the integrated science program is organized as:

1. A core curriculum consisting of basic concepts that are commonly needed for all of the paramedical training programs. The level of instruction should be "introductory" or "survey." If the time allotted for this phase is divided into five equal sequences, Part I should be covered in one sequence and Parts II and III in two sequences each.

2. Training modules that would provide additional material or greater depth of learning to fulfill the specific requirements of each paramedical training program. Reference to "special problems" means that the module will be tailored to the practical requirements of the job.

Core Curriculum

Part I. Introduction to Microbiology. (Emphasis on the bacteria.)

Nomenclature and Classification of Microorganisms. Basis for classification; "Bergey's Manual of Determinative Microbiology;" survey of medically important groups of microorganisms including bacteria, fungi, viruses, rickettsias, protozoa and parasitic worms.

The Microscope. Types of microscopes; use of the ordinary light microscope; fixing and staining smears.

Part II. Characteristics of Microorganisms.

Introduction to Anatomy and Physiology of Microorganisms (only as related to practical aspects of this section.)

Reproduction, Growth and Cultivation. Conditions of growth, growth curve; culture media, pure cultures.

Control of Microorganisms. Sterilization and disinfection; medical and surgical asepsis, common contaminants; chemotherapy, especially antibiotics.

Genetics of Microorganisms. Brief introduction, natural and artificial selection; virulent and drug resistant strains.

Part III. Epidemiology of Microbial Diseases.

Survey of Most Common Human Microbial Diseases.

Sources, Modes and Conditions of Infection.

Body defenses and Resistance to Disease. Mechanical barriers (skin, etc.); phagocytosis; immunity, allergy and anaphylaxis.

Introduction to Reference Material. (Physicians Desk Reference, Merck Manual, etc.)

Special Training Modules

Inhalation Therapist

Normal flora and epidemiology of diseases of the respiratory tract.

Include such secondary pathogens as Staph, Pseudomonas, E. Coli, that cause special problems in this area of work.

Special problems in sterilization, disinfection, asepsis.

Biomedical Technologist: Calibration, Standards and Repair Technician.

None.

Biomedical Technologist: Cardio-pulmonary Specialist.

Epidemiology of microbial diseases affecting the respiratory and circulatory systems.

Biomedical Technologist: Physiological Monitoring Specialist.

Core curriculum only.

Radiologic Technologist.

Normal and pathogenic microorganisms of the respiratory, gastrointestinal, biliary and urinary tracts (as they would be related to practice in this field).

Special problems in control of microorganisms associated with communicable diseases.

Dental Assistant.

Normal and pathogenic microorganisms of the mouth and respiratory tract.

Special problems in sterilization and disinfection; modes of transmission of disease.

Physical Therapy Assistant.

Normal and pathogenic flora of the skin.

Special problems in control of microorganisms, especially those associated with human excretions and with skin infections.

The immunity response in relation to inflammation (i.e., arthritis).

Medical Assistant.

Additional instruction in epidemiology of communicable diseases, especially childhood diseases.

Special problems in control of microorganisms.

Laboratory procedures of the sort that would be practiced in a physician's office:

- Collection and maintenance of specimens.
- Simple culture and identification techniques.
- Procedures for gross analysis of blood and urine.
- Interpretation of laboratory reports.
- Use of the microscope.

Nursing.

Expansion and greater depth of study of epidemiology of microbial diseases in humans.

Special problems on control of microorganisms including disinfection, sterilization, asepsis, isolation and chemotherapy.

Same as medical assistant regarding laboratory procedures.

Same as medical assistant regarding interpretation of laboratory reports.

PHYSICS AND MATH

Robert James, Grossmont College
For an Integrated Science Approach

Students in the various "allied health" areas have sets of requirements which are different from each other and peculiar to whichever area being studied. With respect to the problem of giving each one the training related to his particular area, we must consider carefully whether we shall endeavor to advocate or provide a path which excludes the study of topics other than those whose immediate and definite use is apparent, or whether we shall attempt to provide a path which is a more general coverage of the subject and includes topics which can be categorized as being "nice to know" and knowledge of which is valuable in a more general way but which topics are not specifically needed in the performance of the duties of his occupation.

Probably, our most practical course of action would be to try to provide a path which allows a majority of students to progress somewhere between the two extremes described above. This would be a path which allows the exclusion of all except specific and immediately required topics for those students who desire such a path or who are limited to such a path by other considerations, but which path also allows the branching into related topics, or the excursion into other topics for those students who have the interest, willingness, time and ability to indulge in and to enjoy the wider pursuit of wisdom which is significant to them.

I suggest that an attempt at providing for the wide diversity of needs could take the form of an "educational smorgasbord" in which many and varied morsels are available for the taking and each student partakes according to his hunger and/or need, then ingests until he has sufficiency for his need or has satisfied his hunger to the level of his capacity. There will undoubtedly be some waste with such an arrangement as individuals find certain studies too difficult or otherwise "unpalatable" but the waste is certainly far less than would be incurred by requiring that students take those courses in which there is only a small kernel of learning appropriate to their needs or wishes.

My field is Physics. To set my part of the "smorgasbord table" in an effort to bring about the learning conditions I have described, I propose to make available the following:

I. A Mini-Module of Math

In any attempt to study, understand or work in any of the sciences, there is a certain inescapable required ability to work with numbers and equations. This section offers classroom instruction beginning at the lowest level of mathematics appropriate to individual sections and proceeding to a level which will enable the students involved to begin or continue the study of the area in which they need math. The instruction is arranged in levels increasing in scope and complexity. Any individual student can discontinue further attendance when he has attained his required level of competence, while others can continue to whatever level they need or wish. Also, a student who has a competence above the beginning level can begin attendance when the instruction is at his level and stay in until his needs are met. It is obvious that there will be

required very careful timing in the instruction or flexibility in the rest of the individual's total study program and very close testing, counseling and cooperation between teacher and student so that he can know what "his level" is. In addition to mathematics, this section would include instruction in the use of various types of calculators, slide rule, scalors, counting devices, and whatever type of calculating instrument is appropriate and available. Competence in the topics of instruction in this section are basic to all students in allied health professions. It is, of course, unnecessary for any person who has the competence in math to take instruction in this section, and he can go immediately to his other required courses.

II. The Stream of Physics, Drop by Drop

This consists of intervals of classroom instruction in various topics of Physics. The interval is complete within itself, treats only one topic or concept, and allows but does not require prerequisite attendance at other intervals, other than those basic to all studies as mentioned in part I. Each interval consists of some time in the classrooms and some time in laboratory work. The time in the classroom is arranged with a regular full-time instructor. The number of hours devoted to each interval depends, of course, on the topic and the depth of coverage, but instruction begins with introduction to the topic and continues through a level appropriate to the students involved. The instruction is flexible in that the number of hours of instruction can be increased or the instruction pace or depth can be adjusted according to abilities, interest, time, etc.

In addition, coverage can be extended to include review of or instruction in math, slide rule, etc., which is needed but in less depth than would require the taking of instruction described in Section I. Arrangements and adjustments will be done by mutual agreement between instructor and students during the interval of their association. The laboratory work is done by arrangement, at a time when it is suitable to the student and to the instructor. The time can be arranged any time the school is in session in day or extended day hours, and personnel is available to facilitate the use of equipment.

III. Help Thyself and Each Other

Sometimes conditions are such that it becomes impossible or inconvenient for an individual to meet regular classes. The individual can avoid losing such missed classes or he can supplement his regular classes by the following materials:

a. Audio tutorial tape - film combination

This is a (silent) film loop concerned with a single physics concept which shows an event or experiment in which the concept is demonstrated. Simultaneously with observing the film loop, the student listens to a tape which instructs him to start the film and observe a certain section of it, then stop the film while the tape goes on and explains and comments on the event or experiment just seen in film. At appropriate points the tape provides examples for the

student to work out on his paper while the tape is silent, then when he starts the tape again the solution just worked out by the student is given and completely explained by the tape. In some cases, then other examples follow until the concept is understood and the student has had some practice in working with it. Any student can use the tape-film loop at an arranged time on his own or by suggestion from the instructor.

b. Taped explanations of homework assignments of problems

These tapes are correlated with written solutions of homework problem assignments. Any number of students can use the tape simultaneously whenever school is in session. Many questions from individual students are thus answered which would never have been answered in class due to lack of time or to reluctance to ask questions by the students.

c. Programmed Instruction books

These are in the nature of drill work, but are sometimes of use in providing extra work and practice. Such books are available for the students to check out directly in the physics laboratory and some are also available for purchase at book stores.

d. Special Films

These are films of actual machines which are used in the occupation. They are to be taken in local hospitals, offices, laboratories, etc., and show how a certain physics concept applies in actual tasks associated with particular occupations. An explanation and/or comments is given, either on sound track or on a tape heard simultaneously with the film.

IV. Open House - Lab Happenings - Free

In all physics courses there are a multitude of laboratory experiments, demonstrations, investigations, tests, etc., available from which a few are selected as "those we have time for." Unfortunately, much work with equipment is thereby missed, the performance of which would be valuable experiences for the student. The laboratory is therefore open to students who, by interest (hopefully) or assignment (for example, in case of missed lab work), will come at whatever hours they can and perform experiments "on their own" but with the help of personnel and usually by arrangement under supervision.

V. Tutoring

Available to any student is a tutor, at college expense, with hours by arrangement.

In describing the Physics offerings I have, perhaps, mentioned methods or materials which could be used in other disciplines as well.

It is envisioned that with Physics instruction in "single-concept chunks" as described, that any "chunk" or concept could be planned into the total allied health course of instruction. For example, allowing for cessation of whatever number of hours of the study of the lungs and respiratory diseases until after shifting to an appropriate number of hours of physics work with pressure and gas laws.

In this way, it is hoped that the physics study would become immediately significant and would be directly related to the professional course material at a time "when the iron is hot," and students have a need and (hopefully) a desire to know.

Physics Needed for Dental Assistants

Very little mastery of physics concepts is needed, if we accept the idea that the dental assistant should simply do as her dentist tells her to, without necessarily knowing why or what is happening.

For example, at first thought, it might seem that an understanding of the exact way in which radiation harms tissue would be needed. However, consultation with dentists and dental assistants indicate that she needs only to know that it is harmful and that she must protect the patient and herself.

Further consideration indicates that it is this way with most other tasks she does which involve physics concepts--she does not need to have a mastery of the concept, but merely to know how she is to perform the tasks she must do.

Physics Needed for the Radiologic Technologist

Physics needed, according to consultation with practicing radiologic technologists and related workers, to understand how and why certain events occur. In other words, a physics course to include units of instruction on physics topics. Total required is approximately forty hours of instruction, which is about the equivalent of one semester lecture course with emphasis on electricity and circuits involved with x-ray machines and related equipment; also, great emphasis is needed on x-radiation dangers and exposure dangers.

Physics needed for the Biomedical Technologist (Cardiopulmonary Technologist)

Physics needed is a general complete course with either omission or de-emphasizing of quantum mechanics, atomic physics, gravitation, relativity and other such concepts which are either advanced or abstract or less practical. The mathematical level of complexity in the topics covered would be low level, up to calculus.

Physics Needed for the Physical Therapist Assistant

Physics needed is heavy in all phases of electricity heat and circuits and understanding measurements. Also needed are theories of matter, liquid characteristics, gas laws, light, energy and electromagnetic waves, mechanics and sound, and other topics. Needed in general is a complete physics course which would consist of descriptive study of the usual topics in physics, the mathematical level being very low, to the level of simple algebra.

In the interest of satisfying possible requirements for continuing the education of these people up to higher levels, it is felt that they should not take only those specific topics they require, but should take the general courses, preferably with relation to medical fields pointed out.

Physics Needed in Nursing and LVN's

The conclusion I reach, from the statements heard, is that even at the entry level, people in the nursing occupations need to know about all of the topics included in a general physics course at the descriptive depth. Specific topics in which they should be heavily grounded are:

- a) Electricity and circuits, meters, etc.
 - b) Gas laws, pressure, behavior of gases and liquids, etc.
 - c) Energy, work, forces, etc. involved in mechanics.
 - d) Sound, waves, hearing, ultrasound treatments, etc.
 - e) Light, electromagnetic radiation, etc.
 - f) Heat, temperature, heat exchange, etc.
 - g) Radiation effects, ionizations, etc.
- Others also.

It seems that very little of all the topics in a general physics survey course at the descriptive level would be unneeded by the entry level person in nursing professions -- more so than many other allied health professions.

There were apparently generally favorable comments about modules instead of courses as a method of learning various needed topics.

Chemistry

Jack Holleran, Grossmont College

The elements of chemistry (along with a little related physics) needed for certain allied health occupations are summarized in the table in the following pages. The topics included are a result of interviews with personnel in and about the specified occupations. Only those topics which seemed to the people interviewed as important for entry-level knowledge are marked.

It will be noted that all of the traditional topics for a fundamental introductory chemistry course are not included. Such topics as electronic structure, kinetic molecular theory and chemical arithmetic were felt to be quite unnecessary to these occupations. It will also be noted that some topics unknown to traditional courses are included.

All in all, it is hoped that the changes represent an improvement in efficiency for the teaching of chemistry to the students in these occupational fields.

The occupations are abbreviated in the table as follows:

MA	Medical Assistant
DA	Dental Assistant
RT	Radiologic Technologist
IT	Inhalation Therapist
BT	Biomedical Technologist (Cardiopulmonary Specialist)
PT	Physical Therapist Assistant
LVN	Licensed Vocational Nurse
RN	Registered Nurse

Figure 3i.

KNOWLEDGE	OCCUPATION							
	MA	DA	RT	IT	BT	PT	LVN	RN
Metric units of measurement	x	x	x	x	x	x	x	x
Temperature conversion--C & F	x	x	x	x	x	x	x	x
Mass, weight and density	x	x	x	x	x	x	x	x
States and properties of matter	x	x	x	x	x	x	x	x
Properties of gases	x			x	x	x	x	x
The gas laws				x	x	x		x
Partial pressures of gases				x	x			x
Process of diffusion				x	x	x		x
Forms of energy (esp chem & EM)			x				x	x
Transformation of energy forms			x				x	x
Chemical vs physical changes	x	x	x	x			x	x
Properties of elements, compounds and mixtures	x	x	x	x			x	x
Chemical symbols & formulas	x	x	x	x			x	x
Periodic chart of elements		x	x				x	x
Most common elements in body	x	x	x	x			x	x
Atom as structural unit	x	x	x				x	x
Atomic structure: p,n,&e ⁻	x	x	x				x	x
Molecule as combination of atoms	x	x					x	x
Co- and electro-valent bonding	x	x					x	x
Existence of hydrogen bonds							x	x
High-energy phosphate bonds							x	x
High-energy electrons							x	x
Chem rxns as the making and breaking of bonds		x					x	x
Detection of chem rxns		x					x	x
Importance of energy as product of chemical change	x		x	x			x	x
Calorie as unit of energy	x		x	x			x	x
Ex- & endo-ergonic terminology		x					x	x
Energy involved in making and breaking of bonds		x					x	x
Factors affecting rate of rxn		x	x	x	x	x	x	x
Catalysis		x		x	x	x	x	x
Competing chem rxns				x	x	x	x	x
Nature of chemical equilibrium				x	x	x	x	x
Nature of combustion	x		x	x	x	x	x	x
Natural sources of oxygen	x	x		x				x
Preparation of oxygen for clinical use		x		x				x
Cause and prevention of spontaneous combustion		x	x	x			x	x
Chemical and physical nature of oxygen	x	x		x				x
Cell's need for oxygen	x			x			x	x
Role of oxygen in living matter	x		x	x			x	x
Carbon dioxide and properties	x			x			x	x
Maintenance of O ₂ -CO ₂ balance in human tissue	x							

Figure 3 ii.

KNOWLEDGE	OCCUPATION							
	MA	DA	RT	IT	BT	PT	LVN	RN
Use of oxygen in medicine	x		x	x			x	x
Properties of ozone								x
Nature of oxidation								x
Redox rxns in the body								x
Physical and chemical distinction; metals & non-metals		x						x
Properties of Au, Ag, Hg		x						
Important biological metals				x	x	x	x	x
Alloy as a solution of metals		x						
Important alloys and their properties (esp amalgams)		x						
Some important non-metals viz., chlorine and fluorine		x		x	x	x	x	x
Properties of hydrogen	x						x	x
Natural occurrence of nitrogen				x			x	x
Properties of nitrogen	x			x			x	x
Importance of nitrogen cycle				x			x	x
Relationship among nitrogen: amino acids: urine	x			x	x	x	x	x
Water as compound of H & O	x	x	x	x	x	x	x	x
Importance of H ₂ O to life	x	x	x	x	x	x	x	x
Water as constituent of many forms of matter (as, water of hydration)		x	x	x	x	x	x	x
Hydrolysis, esp in digestion	x	x	x				x	x
Condensation reactions		x						x
Water as solvent & lubricant		x	x	x	x	x	x	x
Sources of H ₂ O for life proc.	x		x	x			x	x
Role of water in medicine	x				x	x	x	x
Nature and properties of soln	x		x	x	x	x	x	x
Classification of solutions	x		x	x			x	x
Importance of solns to physiological processes			x	x			x	x
Solutions of gases in liquids as, O ₂ & CO ₂ in blood	x				x	x	x	x
Ways of expressing concentrations of solutions	x		x				x	x
Osmosis and osmotic pressure				x			x	x
True soln vs colloidal soln and suspension		x	x	x			x	x
Classification, preparation & stabilization of colloids		x						x
Emulsions and emulsification								x
Properties of electrolytes & electrolytic solutions	x							x
Nature of electrolytes and electrolysis	x							x
Properties of ions and ionic solutions	x	x	x	x	x	x	x	x
Functions of ions in the body	x				x	x	x	x
Electrolyte balance in body esp Na ⁺ and K ⁺	x			x	x	x		x

Figure 3 iv.

KNOWLEDGE	OCCUPATION							
	MA	DA	RT	IT	BT	PT	LVN	RN
Uses and kinds of anesthetics		X					X	X
Chem structure of some anesthetics		X						X
Types and properties of nuclear radiation (incl. X-radiation) X		X	X					X
Safety precautions w/ radiation X		X	X	X	X	X	X	X
Medical uses of radiation X			X		X		X	X
Some useful radiochemicals			X					
Nuclear chemistry			X					
Use of geiger counter			X		X			
Basic theory of photography		X	X					
Formation of latent image			X					
Photographic solutions			X					
Exposure fundamentals		X	X					
Development process			X					
Use of instruments such as colorimeter, van Slyke, etc					X			

Figure 3 iii.

KNOWLEDGE	OCCUPATION							
	MA	DA	RT	IT	BT	PT	LVN	RN
Nature and properties of acids and bases	x		x	x	x	x	x	x
Neutralization: formation of salts	x		x	x	x	x	x	x
Naming of inorganic compounds	x	x		x			x	x
Significance of inorganic salts in physiological processes	x		x	x			x	x
Uses of common salts in medicine	x			x			x	x
Strengths of acids and bases	x						x	x
Expressing acidity: use of pH	x			x	x	x	x	x
Hydrolysis of salts	x						x	x
Ways of determining H ⁺ conc.	x				x	x	x	x
Regulation of pH by buffers	x			x	x	x	x	x
Physiological examples of buffer solutions	x				x	x	x	x
Acid-base balance in the body	x				x	x	x	x
Abnormal pH in the human body	x	x			x	x	x	x
Unique characteristics of carbon & role in life processes	x	x		x	x	x	x	x
Classification of carbon compounds		x		x	x	x	x	x
Significance of carbon compounds in medicine	x	x	x	x	x	x	x	x
Types of organic compounds	x						x	x
Organic nomenclature	x							x
Structure and types of carbohydrates	x							x
Sources of carbohydrates for human food	x							x
Role of carbohydrates in human nutrition							x	x
Nature of lipids	x							x
Sources of fats for humans	x							x
Role of lipids in human nutrition							x	x
Significance of saturated and unsaturated fats in human nutrition	x							x
Role of protein in human nutrition	x						x	x
Polymers and polymerization		x						x
Examples of polymers, as acrylics		x						
Peptide bonds								x
Structure of simple proteins								x
Sources of protein for food	x							x
Animal vs plant protein	x							x
Enzymes and their uses				x	x	x	x	x
Nucleic acids (RNA, DNA)								x
ATP & high-energy PO ₄ ³⁻ groups						x	x	x
Examples of vitamins								x
Examples of hormones								x

V. PROBLEMS AND ISSUES

Educational Requirements

The evidence obtained of entry-level performances required and the related educational concepts taught indicated the tendency on the part of some employers to raise educational requirements without precise task analysis assessments. The "credential consciousness" that Berg writes of in "The Great Training Robbery," indicates that education needs to be reformed in America by striking a balance between "too much" and "not enough."¹⁶ A liberal education was often desired, but not required, for task performance. Carlson, writing in the Saturday Review stated, "

You don't improve a person's position in the job market by giving him six months of book learning. What makes him mobile is the experience he acquires. In this way minority members can be more quickly brought into the system.¹⁷

As Dressel has written:

Liberal education can no longer be defined as knowledge of a set of subjects called liberal arts; indeed, liberal education is defined not by knowledge, but rather by behavior and the quality of actions and thoughts.¹⁸

The inclusion of "A Basic Course in Physics," for example, was not based on the total concepts required, but rather on the liberal arts function--"it was nice to know," i.e., it should be included as a general education requirement.

Hours vs. Behavioral Objectives

The question was also raised as to why, for example, inhalation therapists should spend approximately three years in school (84 units - 1800 clinical hours) when a task analysis was not available of entry-level performances required:

What should be the education of a medical assistant, when each employer defines how and what her entry-level performance should be (national bodies have set criteria, but, realistically, the employer sets varying standards.) How does a lattice approach to the health occupations become meaningful if entry-level jobs require such varied levels of performance?

The committee was cognizant of the role of the American Medical Association House of Delegates Council on Medical Education. To date it has approved a total of 13 occupations for which educational programs are accredited by the A.M.A. with collaborating organizations, including the largest allied medical occupations.¹⁹

In order to carry out the assigned charge, it was necessary for the Committee to ruthlessly cut away the "nice to" and "ought to" and reach the essential question of what, why, how and in what depth is this particular concept useful in the performance of entry-level tasks.

Concept Modules and Levels

Referring back to Figure 1, it is noted that, according to Bloom's Taxonomy,²⁰ the basic base-line sciences may be taught at a variety of levels. The descriptive functions vary from knowledge (of specifics, terminology, facts, etc.) of the certified laboratory assistant to the level of the medical technologist, integrating, synthesizing, or (the pathologist) diagnosing.

As a result of the Committee's pattern of analysis, the future synthesis, sequencing and level of instruction tended to lead toward a module approach. A number of differing allied health specialties at varying levels may be studying the same concept in varying or similar modules.

Modules of "need-to-know" would be prepared and used as the curriculum so required, not as in the past of having to spend one or two semesters in a basic course, which then portions had to be retaught at the clinical level. Teach and reteach at a higher level, it is true, reinforces learning; but why not, when discussing gas laws in physics for example, use a Bird respirator to demonstrate these laws to allied health students and at the moment of clinical usefulness?

If budgets for 1971 included funds for the conversion of learning-listening centers, it would be possible to make a start in the direction of module implementation. Possibilities of a consortium approach to funding a pilot project is also a consideration.

Continuing Education

What is required at the entry level? Again and again this question was raised, but with it was implied a further need. Using Bloom's²⁰ Taxonomy and knowing performance competencies at entry and other levels, a concomitant stream of "continuing education" opportunities should be developed to heighten and sharpen the awareness of the graduate after job placement. Ultimately, this would, as Dr. Kirtland wrote, help to move the graduate to the next level of expertise, if the individual and if the employer as well provided financial increments for the additional skills and knowledge. At the fourth Annual California Health Manpower Conference, the recommendation was made that the community colleges and state colleges should be utilized to a greater extent for continuing education.²¹ In a University of Illinois report, Continuing Education For the Health Professions, without exception

interprofessional continued education was recommended not only as desirable but feasible and also important from the standpoint of developing favorable attitudes toward each other.²²

Professional Certification, Registry and Licensure

Of the three types of technical qualifications for allied health workers, education, work experience and examination, the last, the testing requirement, is probably the most critical.

In each of the Committee meetings with the allied health educators came the statement, "If only these critical 'essences' of basic science are taught, the student will not be able to pass his certification (registry or licensing) exam."

The Education Testing Services inspection of several licensing examinations revealed that they tended to emphasize recall of facts and small details. In fact, there were only two notable exceptions in all licensing examinations pointed out by Education Testing Service, and these were national examinations prepared by professionally trained testing specialists.²³

Dr. Richard Kingston's University of California, Los Angeles, study demonstrated that the Dental Assistant Task Analysis included tasks only because they were on the board examination; and yet the examination developers used the item because it was being taught in the curriculum! They are in the process of revising this, however, with expanded functions looming on the horizon.

Once students and in-service dental assistants are motivated towards seeking certification, . . . which seems to have ever-increasing implications and importance, and as educational institutions make the instructional materials more readily

available so that they may enjoy more extensive and widespread utilization, it then becomes the responsibility of certifying agencies to make those necessary modifications in their certifying methodologies to allow for evaluation by performance, rather than exclusively by credentialism.²⁴

What are the competencies, not what are the recall questions or the number of hours, must be the criteria. If change cannot come about through the professional societies, the allied health professions and the American Medical Association Council on Medical Education, there is no further need for medical representatives to charge the educational institutions to develop "core curriculum" and provisions for lattice-ladder career mobility.²⁵ The instructional program is fitted into a Procrustean bed of traditional subject matter. Until this issue is reconciled, however, it may be necessary to drill students to pass licensing, certification or registry examinations in order to not penalize students' present "credentialling" through innovation.

Transfer Requirements

The original objective was:

. . .to provide students with a level of general education in the field of biology and allied sciences comparable to that offered in science courses required as general education in other curricula.

Collins states that general education implies transfer courses. There is a feeling that there is a clear-cut differentiation between transfer and terminal. However, this is a myth without foundation. Most terminal courses in vocational training are as difficult and demanding as transfer courses, and, in fact, most courses with terminal numbers are transferable to one senior college or another.²⁶

Consequently, when the argument was raised to include a particular science course to meet solely "transfer" or General Education requirements, the position taken was to recommend the use of equivalency examinations or other demonstrations of knowledge required in particular transfer course if and when the student indicated his desire to transfer. However, a more fundamental question is unresolved: Why could not the core curriculum meet General Education requirements? The local community college has the responsibility to stamp transcripts "G.E. requirements met." This issue must be resolved; otherwise, again the proposed core program will become a "lesser than", and students will not enroll.

Another question raised has been how one can provide upward mobility when cutting down instead of building on? The Committee felt its charge was to distill out the concepts and then build them back to allow the lattice approach where definite components were identified as required for one or another program. When out of every 100 students who enter the community college there are 65 to 70 who say, "To hell with it," there is a need to stretch the definition of college to fit the new societal goal of universal higher education and, in the process, to recruit students for the allied health fields who will remain in the programs to completion of adequate competency levels--and not be washed out by unrealistic standards applied to all.

Curriculum committees, instructors and administrators should work to convince senior colleges of the need to broaden their range of curricula to accept a much broader range of transfer students. For example, the new 1970 community college instructor credential in vocational technical programs

(allied health) opts for a new kind of senior college experience. Upper division programs need to be redesigned to meet this new need.

Dr. Neel, Biology Chairman, San Diego State College, indicated in a recent conference that for community college students who later wished to major in the department, there was no reason why "mini-courses" could not be proposed to fill in any gaps in their basic foundation.²⁷

VI. RECOMMENDATIONS

The Committee concluded that they wanted to report to their own departments and colleges and plan for a workshop for December 28 to 31 and the afternoon of January 8. At this workshop the individual community college allied health educators and the science faculties could meet and work together, as well as share across colleges to refine, modify and develop the science concepts included herein.

Recently, Irvine H. Page, M.D., editor of Modern Medicine, has stated that the greatest obstacle to the delivery of health care is the inability of physicians, government, (education) and responsible representatives of the consumer and business field to work in harmony to do a job.²⁸

The question before the San Diego and Imperial communities, therefore, is to what extent there is a commitment for the improvement of the quality and delivery of health services? To provide opportunities for upward and lateral mobility in health careers? Will a student be able to move from the new paramedical occupations programs now established or in the process of being established in county regional centers, adult schools, high schools, etc., to community colleges, the state colleges, private colleges and the

university? Can articulated pathways develop while at the same time providing core curricula to enable mobility laterally from one allied health occupation to another with a minimum of retreading or recycling? Is it a dream? The Task Force Core Curricula Committee has completed its preliminary report. The next move is up to you.

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APPENDIX A.
CONSULTANTS INTERVIEWED

Dental Assisting

Meridith Craft, Graduate, Dental Assisting Program.

Mary Ann Escamilla, Head, Dental Assisting Program, Grossmont College.

Jack Francis, D.D.S., Chairman, Dental Assisting Advisory Committee.

George Gerrodette, D.D.S., Head, Dental Auxiliary Programs, Mesa College.

Shirley Leonhardt, Instructor, Dental Assisting Program, Mesa College.

Natalie Swanson, Dental Hygienist Association, Representative.

Medical Assisting

Evelyn Duty, R.N., Head, Medical Assisting Program, Mesa College.

Radiologic Technologist

William Basinger, Radiologic Technologist, Doctors Hospital, San Diego.

Joe Biondo, Student completing internship in radiologic technology, San Diego.

James Bray, Administrator, Doctors Hospital, San Diego.

Phillip G. Koppang, Head, Radiological Technology, Mesa College (Mercy Hospital)

Inhalation Therapist

Thomas D. Byler, Head, Inhalation Therapy, Grossmont College.

Kenneth Moser, M.D., Director, Pulmonary Division, University Hospital, San Diego.

Physical Therapy

Bryan Durham, Head, Physical Therapy Program, San Diego City College (Mercy Hospital)

Biomedical Technologist

Willard Dellegar, Head, Biomedical Engineering Program, Grossmont College.

Norman Lockhart, C.P.T., A.R.I.T., Foothill Medical Hospital.

Kenneth Moser, M.D., Director, Pulmonary Division, University Hospital, San Diego.

Webster T. Russell, Chief Cardiotechnologist, Doctors Hospital, San Diego.

Nursing

Ellen M. Abbott, R.N., Director-Coordinator, Vocational Nursing, Grossmont High School District.

Elaine Bogin, R.N., Nursing Representative, Regional Medical Program.

Connie Carter, R.N., Graduate of Southwestern College Associate Arts Degree Program.

Walter Coats, Coordinator of Vocational Education, Chairman, RMP-CHP Allied Health Manpower Committee.

Florence Downs, R.N., Head, Vocational Nursing, San Diego City College.

Alice Eickhoff, Acting Administrator, Director of Nursing Services, Kaiser Foundation Hospital.

Mary Fulton, R.N., Head Nursing Program, Palomar College.

Richard Jacobsen, R.N., Director, Comprehensive Health Planning.

Sally Kilgore, L.V.N. Program, San Diego City College.

Paula Liska, Health Services, San Diego City College.

Thomas Lyons, M.D., Private Practice, La Mesa, California.

Mildred MacMillan, Director, Vocational Nursing, Mesa College.

Dorothy Moses, R.N., Nursing Department, San Diego State College.

Sister Helene Marie Sauers, R.N., Chairman, Paramedical Department, Southwestern College; Member, Board of Nurse Education and Registration.

Velina Tews, R.N., Vocational Nursing, Mesa College.

APPENDIX B.
ORGANIZATIONS AND INDIVIDUALS CONTACTED

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Dr. Kay Goldsmith, Deputy Director, Allied Health Professions Project, University of California at Los Angeles.

APPENDIX C.

JOB DESCRIPTIONS

The Biomedical Technician will augment the capabilities of the doctors' diagnostic skills through the use of electronic monitoring and sensing devices. The two areas of specialization presently being taught at Grossmont College are:

The Biomedical Electronic Equipment Specialist. This person will be chiefly concerned with maintaining, calibrating, and repairing complex medical electronic devices. The work will be performed at a facility in the larger hospital or as part of a field operation system serving several small hospitals and/or clinics.

The Biomedical Cardio-pulmonary Specialist. This person will work in a cardio-pulmonary laboratory under the supervision of a physician. He will have the ability to work under both normal and emergency situations utilizing such equipment as respirometers and analyzers for the determinations of pulmonary function; electronic and manual equipment for the determinations for blood gas and expired gas parameters; equipment utilized in the cardiac-catherization laboratory (that is, transducers, amplifiers, recorders, etc.) He will also be qualified to set up, calibrate and record data on electronic equipment such as the electrocardiograph, vectorcardiograph, and phonocardiograph, and equipment used during physiologic stress studies.

He may also be employed in the research area of the hospital or research clinic performing physiological monitoring functions electronically, either by direct methods or indirect methods such as those utilizing telemetry systems.

Bioelectrical Monitoring - The process of observing and/or recording the electrical potential generated by the various systems of the body.

*EEG (Electroencephalographic) Technician. Assists or aids the physician in obtaining information about the function of the brain by recording the electrical activity produced by the brain cells. Tasks include operating various items of electronic equipment, recognizing defective equipment and making minor repairs and adjustments; providing patient care during the diagnostic test; organizing the laboratory work schedule; preparing reports; and cataloging and storing records.

*EKG (Electrocardiographic) Technician. Performs screening EKG tests in which he manipulates electronic equipment utilized in recording the electrical potentials generated by the pulsating action of the heart. Usually prepares and mounts EKG records and utilizes a filing system. He usually works with a single unit recorder. May assist in research projects or other tests that require additional electronic equipment.

* Occupations marked with an asterisk are now being developed by UCLA.

Job Descriptions

EMG (Electromyography) Technician. Assists the doctor in recording and analyzing bioelectric potentials which originate in muscle tissue. Tasks include operating various electronic devices; calibrating, repairing and adjusting defective equipment; assisting the doctor with patient care; organizing the laboratory work schedule; and preparing reports; catalogs and files reports; may assist the doctor in other neurophysiological tests or research efforts.

Respiratory Care Functions

Cardiopulmonary technician. Performs a wide range of tasks related to the function and therapeutic care of the heart-lung system: performing blood gas analysis, oxygen consumption studies, the measurement of metabolic rate, and pulmonary function tests. May be called upon to assist in cardiac catheterization in the operating room, or in open-heart massage in the emergency room. Other tasks include the post-operative monitoring, care, and treatment of the heart-lung patient.

*Inhalation therapist. Administers the therapeutic gases prescribed for the patient by the physician. Is directly responsible for regulating concentration of gas volume, pulmonary function tests, and assisting the patient's ventilation with various mechanical aids. May assist the physician in administering pharmacological aerosols or mists.

Dental Occupations

*Dental assistant. An unlicensed dental auxiliary functioning under the direct supervision of a licensed dentist. Duties include providing another pair of hands at the chairside during dental procedures, preparing a variety of dental materials for use at the chair, caring for instruments and equipment within the dental operatory, and a variety of other procedures related to secretarial, bookkeeping, receptionist and general office duties. Also is permitted in many states to expose and process dental radiographs.

*Dental Hygienist. Licensed by the state to function under the direct supervision of a licensed dentist. Performs in-the-mouth functions related to the cleaning and polishing of teeth, applies topical fluoride solutions to the teeth, and exposes and processes dental radiographs. Also is trained in patient education and instructs the patient in basic home care and oral hygiene procedures.

*Dental laboratory technician. Is trained to fabricate a wide variety of dental restorations: i.e., crowns, bridges, dentures, etc., and is responsible for filling the prescription of a licensed dentist and providing a finished dental restoration ready for placement in the patient's mouth by the dentist. Works either in a commercial dental laboratory or in the offices of a private dental practitioner.

Medical Assistant

*Medical office assistant. High-level responsibilities include assisting the physician in the administrative and technical aspects of operating and managing a physician's office. Various levels of performance are related to the individual's training and skills and the delegation of duties by the physician.

Job Descriptions

Nursing Occupations

***Registered Nurse (Technical).** Licensed by law, attends to the physical comfort and safety, physiologic malfunctions, psychological and social problems, and rehabilitative needs of patients. Performs nursing measures, medically delegated techniques; participates in planning, implementation and evaluation and revision of nursing care.

***Licensed Vocational/Practical Nurse.** Licensed by law to practice in a number of states. Under the supervision of the Registered Nurse or physician, provides personal care to patients, administers less complicated nursing procedures and treatments, assists in performing more complex procedures, and cares for the critically ill.

***Nursing assistant.** Nurses' Aide, Attendant, Orderly. A non-licensed practitioner, working under the supervision of the Registered Nurse. Provides personal care to patients and performs routine housekeeping duties. Education usually is on the job, but is increasingly offered in community colleges and vocational high schools.

Physical Therapy - Directed toward the restoration and maintenance of body movement in patients who have, through disease or accident, lost the use of a limb, or whose muscles or joints do not function properly, through use of various exercises, massages, and special training equipment.

Physical therapy assistant. Has successfully completed a two-year community college program approved by the American Physical Therapy Association. Assists the Physical Therapist by carrying out specified physical treatment programs, such as ambulation and activities of daily living practices, and the application of heat, cold, light, water and sound. Cares for braces and other assistive devices and carries out appropriate clerical and maintenance responsibilities.

Radiologic Technology

***Diagnostic technician.** Produces radiological films utilized for the diagnosis of disease and for research into its cause and process; under direction, applies X-ray radiation in prescribed amounts to specified areas of the body as part of disease treatment programs.

***Therapeutic technician.** Assists in carrying out diagnostic procedures utilizing radioactive isotopes. Also aids in the application of intense, high-level radiation in various treatment procedures usually related to human malignancies.

APPENDIX D.

MESA COLLEGE DENTAL ASSISTING PROGRAMS

(Courses by their titles and degree of core application)

<u>NUMBER</u>	<u>TITLE</u>	<u>UNITS</u>	<u>DA</u>	<u>DH</u>	<u>DLT</u>	<u>DRA</u>
DA-1	Orientation to Dental Auxiliary Programs	2	x	x	x	x
DA-2	Dental Anatomy and Physiology	5	x	x	x	x
DA-3	Dental Anatomy and Morphology	2	x	x	x	x
DA-4	Dental Embryology	1	x	x		x
DA-5	Dental Histology	1	x	x		x
DA-6	Dental Pathology	1	x	x		x
DA-7	Dental Microbiology	2	x	x		x
1-a	Chemistry	5		x		
2-a	Chemistry	4		x		
LA-8	Pharmacology and Anesthesiology	1	x	x		x
DA-9	Dental Radiography	2	x	x		x
DA-10	Dental Laboratory Procedures	1	x	x	x	x
DA-11	Dental Materials	2	x	x	x	x
DA-12	Full Denture Construction	2			x	
DA-13	Partial Denture Construction	2			x	
DA-14	Crown, Bridge and Inlay Construction	2			x	
DA-15	Dental Ceramics	2			x	
DA-16	Fundamentals of Dental Assisting	1	x	x		x
DA-19	Dental Assisting Techniques, Adv. A	4	x			x
DA-20	Preventive Dentistry, Nutrition, Community Health	2	x	x		x
DA-21	Periodontics	4		x		
1	English	3	x	x	x	x
14	English	3	x	x	x	x
19	English	3	x	x	x	x
3	Speech Arts	3	x	x	x	x
1	Psychology	3	x	x	x	x
55	Psychology	3	x	x	x	x
DA-22	Clinical Psychology for Dental Auxiliary	2	x	x		x
	Physical Education (four semesters)	2	x	x	x	x
16	Mathematics	3	x	x	x	x
10	Political Science	3	x	x	x	x
30	Typing	3	x			
R	Typing	3	x			
41	Typing	3	x			
31	Typing	3	x			
51	Accounting	3	x			
DA-23	Dental Practice Management	3	x	x	x	x
DA-24	Dental Hygiene	2		x		
DA-25	Dental Hygiene Clinical Practice A	2		x		
DA-26	Dental Hygiene Clinical Practice B	4		x		
DA-27	Dental Hygiene Clinical Practice C	4		x		
DA-28	Operative Dentistry	4				x
DA-29	Dental Restorative Assistant, Clinical Prac.A	2				x
DA-30	Dental Restorative Assistant, Clinical Prac.B	4				x

DA-31	Metallurgy for Dental Auxiliary	3				X	
DA-32	Introduction to Dental Specialties	1	X		X		X
DA-33	Dental Assistant, Specialty Practice	3	X				X
DA-34	Full Denture Construction, Adv. A	5				X	
DA-35	Full Denture Construction, Adv. B	5				X	
DA-36	Full Denture Construction, Adv. C	5				X	
DA-37	Partial Denture Construction, Adv. A	5				X	
DA-38	Partial Denture Construction, Adv. B	5				X	
DA-39	Partial Denture Construction, Adv. C	5				X	
DA-40	Crown, Bridge and Inlay Construction, Adv. A	5				X	
DA-41	Crown, Bridge and Inlay Construction, Adv. B	5				X	
DA-42	Crown, Bridge and Inlay Construction, Adv. C	5				X	
DA-43	Dental Ceramics, Adv. A	5				X	
DA-44	Dental Ceramics, Adv. B	5				X	
DA-45	Dental Ceramics, Adv. C	5				X	
DA-46	Dental Assisting Office Management	2	X				X
DA-47	Dental Assisting Tech., Adv. B	4	X				

"FOUNDATION" MODEL FOR INTEGRATED SCIENCE COURSE

CONCEPTS: Physics-Chemistry

Forms of energy

Mass tool relation

Motion

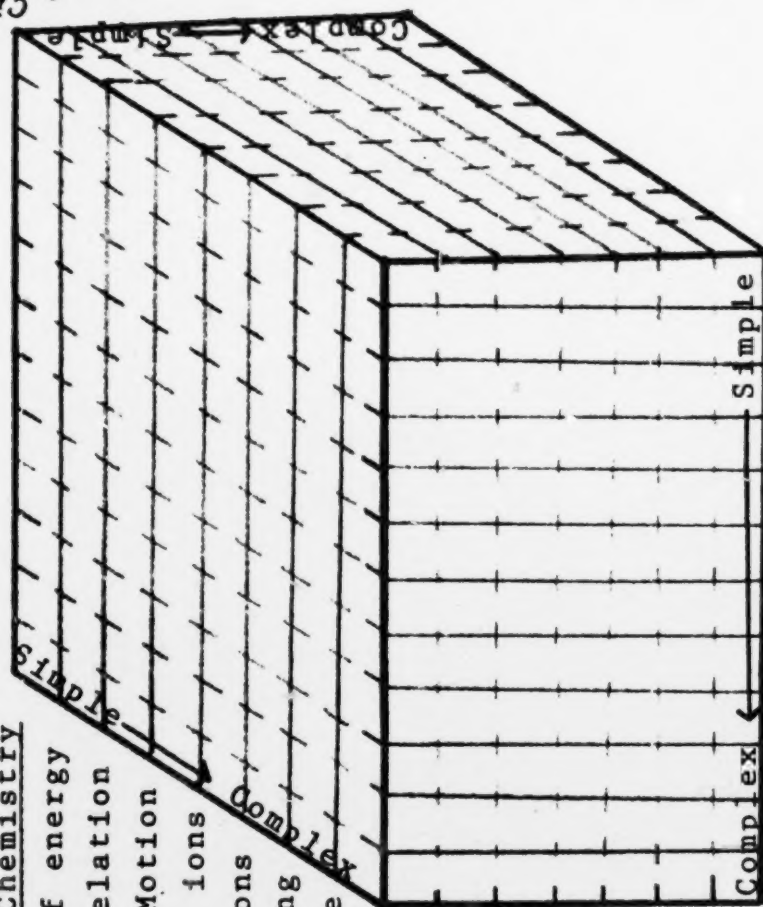
Electricity, ions

Common chemical reactions

Chemical bonding

Energy; sources & expenditure

Etc.



CONCEPTS: Scientific Method
Order in structure
Order in function
Balance in order
Living vs. nonliving systems
Etc.

CORE TOPIC SEQUENCE

CONCEPTS: Life Sciences-Chemistry

Atoms

Units of science measurement

Mols

"Matter"

Cells

Tissues

Organs

Organ Systems

Organism - Man

Micro organisms

Ecological relationships

Etc.

Throughout:

- Stress medical "relativity" to clinical work
- Current topics, research, etc.

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